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Abstract

Laser short pulse heating of a multi-layer assembly, which consists of different layer properties, results in a non-similar electron and lattice site temperature distributions in the layers. This is because the differences in the amount of energy transfer in each layer despite the fact that each layer is very thin. Consequently, an investigation into the temperature distribution in the electron and lattice sub-systems in each layer is essential. In the present study, laser short-pulse heating of a three layer assembly, consisting of Au-Cr-Cu, is examined. The electron and lattice site temperature rise in each layer is predicted using an electron lattice theory approach. Three-dimensional heating situation is accommodated in the model study. The Seebeck coefficient in each layer is computed and compared with the results of the previously derived equation. It is found that the electron temperature distribution varies in each layer and that this variation affects the lattice site temperature distribution. The lattice temperature distribution in the radial direction is not influenced by the diffusion of energy in the radial direction. Abrupt changes in the Seebeck coefficient across chromium and copper layers are observed.